

## CLAIMS

What is claimed is:

1. A method for automatically detecting nodules from images, the  
method comprising:  
generating a seed point from a plurality of images that define a volume;  
defining a volume of interest comprising the seed point;  
choosing principal viewing axes within the volume of interest;  
re-slicing the volume of interest along one of the principal viewing axes;  
computing volume projection curves of the re-sliced volumes along the  
principal viewing axes;  
analyzing the shapes of the volume projection curves; and  
detecting a nodule in accordance with the analyzed shapes.
2. A method as defined in Claim 1, further comprising:  
smoothing the volume of interest using a set of pre-selected scales.
3. A method as defined in Claim 1, further comprising:  
estimating nodule size and position.
4. A method as defined in Claim 1 wherein analyzing comprises:  
Gaussian curve fitting;  
Gaussian size testing;  
Gaussian size-ratio testing;  
value drop-off testing; and  
error-of-fit testing.
5. A method as defined in Claim 1 wherein said images comprise at  
least one of high-resolution, thin-slice and multi-slice computed tomography  
images.

6. A method as defined in Claim 1 wherein the volume comprises a lung volume.

7. A method as defined in Claim 1 wherein said nodule comprises a vessel-feeding pulmonary nodule.

8. A method as defined in Claim 1 wherein said nodule comprises a solitary pulmonary nodule.

9. A method as defined in Claim 1, further comprising: displaying said nodule.

10. A method as defined in Claim 1 wherein said defining a volume of interest comprises:  
defining a shape and a size of the volume of interest.

11. A method as defined in Claim 1 wherein said detecting comprises: recording a detected, anatomical structure for future retrieval.

12. A method as defined in Claim 1 wherein said detecting comprises: excluding non-nodule structures from further evaluation.

13. A method as defined in Claim 9 wherein said displaying said nodule comprises:

rendering surfaces of said nodule to provide three-dimensional visualization with the freedom of 3-D rotation.

14. A method as defined in Claim 1, further comprising: storing the automatic detection decision.

15. A system (100) for automatically detecting nodules from image data, the system comprising:

a seed point generation unit (150) for examining the volume to generate a seed point;

a volume of interest generation unit (170) in signal communication with the seed point generation unit (150) for defining a volume of interest comprising the seed point;

a volume projection unit (180) in signal communication with the volume of interest generation unit (170) for projecting 1-D curves indicative of shape; and

a volume projection analysis unit (190) in signal communication with the volume projection unit (180) for detecting a nodule.

16. A system (100) as defined in Claim 15 wherein said images comprise high-resolution, thin-slice, multi-slice, computed tomography images.

17. A system (100) as defined in Claim 15 wherein said volume comprises a lung volume.

18. A system (100) as defined in Claim 15 wherein said nodule comprises a vessel-feeding pulmonary nodule.

19. A system (100) as defined in Claim 15, further comprising:  
a CPU (102) in signal communication with said volume projection analysis unit (190) for examining said nodule.

20. A system (100) as defined in Claim 17, further comprising:  
a display adapter (110) in signal communication with the CPU (102) for displaying said nodule; and

an I/O adapter (112) in signal communication with the CPU (102) for recalling the shape features of the nodule.

21. A system (100) as defined in Claim 19, further comprising:  
a user interface adapter (114) in signal communication with the CPU (102)  
for receiving an external selection decision for a seed point from a user.

5 22. A system for automatically detecting nodules from image data, the  
system comprising:

means for generating a seed point from a plurality of images that define a  
volume;

means for defining a volume of interest comprising the seed point;

means for choosing principal viewing axes within the volume of interest;

means for re-slicing the volume of interest along one of the principal  
viewing axes;

means for computing volume projection curves of the re-sliced volume  
along the principal viewing axes;

means for analyzing the shapes of the volume projection curves; and

means for detecting a nodule in accordance with the analyzed shapes.

10  
15  
20 23. A program storage device readable by machine, tangibly  
embodying a program of instructions executable by the machine to perform  
method steps for automatically detecting nodules from image data, the method  
steps comprising:

generating a seed point from a plurality of images that define a volume;

defining a volume of interest comprising the seed point;

choosing principal viewing axes within the volume of interest;

25 re-slicing the volume of interest along one of the principal viewing axes;

computing volume projection curves of the re-sliced volumes along the  
principal viewing axes;

analyzing the shapes of the volume projection curves; and

detecting a nodule in accordance with the analyzed shapes.